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Test Plan, Field Test FT-60 Radioactivity Sampling for On-Site Inspections

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FIELD TEST
PROGRAM

TEST PLAN

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FIELD TEST FT-60
RADIOACTIVITY SAMPLING FOR ON-SITE INSPECTION

AUGUST 28, 1969

UNITED STATES ARMS CONTROL
AND DISARMAMENT AGENCY, Washington
D.C.

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TEST PLAN

FIELD TEST FT-60

RADIOACTIVITY SAMPLING FOR

ON-SITE INSPECTION

28 August 1969

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The Field Operations Division of the Weapons Evaluation and Control Bureau assumes overall responsibility for the development of this document.

This Plan is part of a broad program of research on inspection and verification and does not express a U.S. position.

Prepared By

FIELD OPERATIONS DIVISION
WEAPONS EVALUATION AND CONTROL BUREAU
UNITED STATES ARMS CONTROL AND DISARMAMENT AGENCY

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SYNOPSIS

The research proposed in this test plan will provide essential data on verification aspects for a Comprehensive Test Ban.

We intend to take surface samples of soil gas, free air and water over a period of months at the site of the RULISON event. These samples will be analyzed for evidence of radioactivity resulting from RULISON. Sample taking, analysis and interpretation will be done by a contractor. Final interpretation, and reporting will be performed in house by ACDA.

Table of Contents

I. BACKGROUND

The work outlined by this test plan is intended to provide basic scientific information on the problems of identifying an underground nuclear test during on-site inspection by radioactivity sampling. The U.S. government has a declared position of supporting a comprehensive test ban adequately verified. As a condition, it has insisted that on-site inspection of some seismic events of undetermined origin is necessary for adequate classification of ambiguous events.

Instructions in March 1969 by the President to the United States Delegation to the Eighteen-Nation Disarmament Committee (ENDC) stated that the United States supports the conclusion of a comprehensive test ban adequately verified, and further, that in view of the fact that differences regarding verification have not permitted achievement of this key arms control measure, efforts must be made towards greater understanding of the verification issue.

The Advanced Research Projects Agency of the Department of Defense (ARPA) for several years has sponsored an extensive research program on the techniques and procedures which might be used in the conduct of such on-site inspection. Two of the most important techniques being developed are visual inspection for evidence of underground nuclear testing and the collection of gases at the surface of a nuclear event and their analysis for radioactivity. ACDA and DoD jointly conducted a field test, FT-1A*, which gave some data on the capabilities and limitations of test teams to detect anomalous items under controlled test conditions.

Concurrent to the development of the procedures for detecting anomalous evidence there must be continuing research in determining the levels of such evidence which

*FT-1A On-Site Inspection for the Identification of Underground Nuclear Tests (U)

are to be found about underground nuclear tests. Some such research on free air, soil gas and water sampling has been performed. The feasibility of procedures has been amply demonstrated and considerable progress has been made in the development of collection and analysis procedures and equipment.

Most of this research, has, of necessity, however been carried out in conjunction with relatively shallow (in terms of scaled depth) underground nuclear tests. More information is needed on the occurrence of detectable amounts of radioactive gases near or at the surface following relatively deep underground nuclear explosions. Such information is needed for estimating the success which might be expected from on-site inspections at the sites of suspected clandestine underground nuclear tests.

Much of the previous research in gas sampling for radioactivity has also of necessity been conducted at the Nevada Test Site (NTS) in the vicinity of many underground nuclear tests. Consequently, there have been ambiguities in determining the origin of some of the detected radioactivity. Some sampling has been done at the site of a relatively deep nuclear test conducted off of NTS but the results were not conclusive.

The Division of Peaceful Nuclear Explosives of the Atomic Energy Commission is directing a series of deep nuclear explosions as part of the Plowshare Program. The purpose of this series is to study the use of underground nuclear explosions for the recovery of natural resources, an example of which is natural gas production stimulation. Because of their depth and remoteness from previous underground nuclear testing, these deep Plowshare explosions are of special interest to ACDA in its program of research in on-site inspection.

II. PURPOSE

The essential purpose of this Field Test is to develop information regarding the occurrence of detectable amounts of radioactive gases at or near the earth's surface resulting from deep underground nuclear explosions. The information from these two tests is expected to provide a baseline of detection information. Combined with the knowledge of test conditions a starting point for detection under those conditions will be known. Further development of this research may be undertaken according to the results obtained.

Ancillary objectives are to determine over what period of time relative to the time of the explosion, such radioactive gases are present in detectable amounts and to determine the extent of the surface distribution of the radioactivity relative to the emplacement hole.

III. SCOPE

Free air sampling, soil gas sampling and the strippings of dissolved gases from water samples are to be undertaken. For each of these techniques, the contractor will plan and conduct the sampling operations. He will analyze and interpret the collected samples and report to ACDA the data and interpreted results.

Activities are to be carried out at two deep underground nuclear explosions which are distant from previous events. The first of these nuclear detonations is the RULISON event scheduled for September 4, 1969 near Rifle, Colorado. RULISON is planned as a 40 kiloton yield explosion at a depth of 8,430 feet. This test plan, Phase I of the overall investigation, concerns that event. Phase II, covering activities for the other event will be the subject of a subsequent test plan and reference to it is made for information only.

The emphasis throughout this research should be on the essential question of whether detectable amounts of radioactivity gases are present at the surface. The questions of the distribution of the radioactivity in time and location should be addressed only to the extent necessary for providing reasonable confidence for the answer to the primary question. A detailed investigation of surface patterns of radioactivity is not intended.

With respect to time the intent is to determine approximately, not precisely, the time of appearance and disappearance of radioactive gases. The times of interest for on-site inspection are between 30 days and 9 months following the detonation. It is anticipated that three or four sample collection operations during this interval would be adequate. The timing of these operations should be based on half-lives of relevant radioactivities and on previous sampling experiences and should minimize the effects on sampling results of such post-detonation activities as the scheduled drill back.

It is not expected that any further equipment research or development will be needed for the performance of this research. In addition, the further development of procedures for sampling and laboratory analysis would be done only to the extent required for meeting the primary objective.

IV. CONCEPT

A. GENERAL PLANNING

The basic techniques for detecting radioactivity at the surface above an underground nuclear test have been developed. ARPA has sponsored considerable research in determining optimum nuclides to assay for. Also, reliable, workable equipment and procedures have evolved over a period of years under ARPA's contracts. All of the accumulated knowledge is to be applied in this attempt to detect radioactivity at deep nuclear events.

Phase I of this Test Plan concerns the nuclear event, RULISON. Since considerable information on RULISON has been available detailed planning as outlined below has been possible. Results from the RULISON phase will be used to improve the Phase II plan.

B. PHASE I RULISON

1. Detailed Planning. Sampling, analyzing and evaluating samples of Free Air, Soil Gas and Gases dissolved in Water collected about the deep PLOWSHARE event called RULISON event based on access to the sites at about D+30 days and two or three later periods, e.g. D+3 months. Optimize collection plan details of location, time of day, logistics, accessibility and minimize effects of test operations such as drill back on results.

2. Soil Gas Sampling. Locate 5 to 15 soil gas well sites including 2 background locations, determine access right requirements and obtain necessary authorizations. Prepare wells for sampling. Provide duplicate samples at each well taken at sufficient interval to allow reestablishment of equilibrium conditions during each of the 3 or 4 sampling periods.

3. Free Air Sampling. Specify approximately 10 Free Air Sampling sites including 2 background locations. Provide correlation with Soil Gas Sampling sites for interpretation of relative results. Obtain duplicate samples at each location during each of the 3 or 4 sampling periods taken at optimal time of day. Provide data on meteorological conditions at time of collection.

4. Free Air Calibration. Perform a Free Air Calibration of unknown source along the following lines: Following the collection of Free Air Samples during a stable meteorological period by regular methods, emplace a source of Xenon-133 or Krypton-85 near Surface Ground Zero or the suspected primary source of effusion. Resample at all sampling locations after the standard source's effects are estimated to be at equilibrium throughout the region. Calculate calibration at each free air sampling location.

5. Ground Water Sampling. Determine locations for obtaining approximately 10 samples of ground water (stream and pond if draining event site) including two background locations. Obtain duplicate water samples of appropriate size for each location during each of the 3 or 4 sampling periods.

6. Analysis. Analysis of samples of soil gas, free air and water samples for anomalous radioactivity.

7. Evaluation and Interpretation. Evaluation of data produced during sampling, and analysis and determination of instances of detection of radioactivity. Judgement of results and interpretation of anomalous values. Preparation of findings by sample type and sampling date. Qualitative comparison of results with previous data on similar sampling investigations. Preliminary projection of results to generalized case of underground nuclear events.

C. PHASE II

Preparation and conduct of an exercise similar to Phase I, RULISON. Nuclear event investigated to be determined based on schedule, event characteristics and Phase I results. Conduct of operations and preliminary and final reporting.

V. RESPONSIBILITIES

A. The Field Operations Division will be responsible for overall test direction to include:

1. Setting of test objectives
2. Preparation of technical plan
3. Approval of changes to plans
4. Coordination of plans with appropriate organizations
5. Execution of operational support
6. Preparation of Final reports and documentation

B. The Technical Support Contractor will be responsible for:

1. Preparation of drafts of detailed technical plan
2. Performance of sampling and analysis tasks
3. Reporting on evaluation and interpretation of results
4. Preparation of contractor final report for each test.

VI. RESOURCES

A. FUNDING

Approximately $90,000 of effort is required for the work proposed in this Test Plan. Approval in principle is requested for $90,000 of FY 70 funds. This covers Phase I activities as now planned. If there is a technical requirement for a fourth sampling sortie and attendant costs during FY 70, additional funds amounting to $20,000 will be required. No request for such funds is now made because of the uncertainty of whether needed. Phase II is presented for information purposes only. That activity will be the subject of a subsequent Test Plan. Approval for it will be requested at an appropriate later date.

	FY 70	FY 71	Total
Phase I			
Contract Support	$85,000		$85,000
Operational Support	5,000		5,000
			$90,000
Phase II (info)			
Contract Support		$85,000	85,000
Operational Support		5,000	5,000
			$90,000

B. MANPOWER

Manpower utilization for FT-60, excluding contractor personnel is estimated to be as follows:

Agency	Persons	Functions	Effort Man-Months
ACDA/WEC/FO	1	Test Director	4
	1	Asst Test Director	3
	1	Operational Support	2
			9

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TO RHWNEAA/MR. R.E. MILLER MANAGER NEVADA OPERATIONS OFFICE

USAEC LAS VEGAS NEVADA

INFO RHEGAAA/J.S. KELLY, USAEC, OPN, WASH., D.C.

RHEGAAA/MAJ GEN E.B. GILLER, USAEC, AGMMA, WASH., D.C.

RHEGAAA/M.B. BILES, USAEC, DOS, WASH., D.C.

RHEGAAA/A.M. LABOWITZ, USAEC, GM, WASH., D.C.

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UNCLAS STATE 203450

WE ARE INDEED AWARE OF THE CURRENT LITIGATION INVOLVING PROJECT RULISON. BE ASSURED THAT NO RPT NO PORTION OF OUR FIELD TEST FT-60 AT PROJECT RULISON WILL BE CARRIED OUT PRIOR TO FULL COORDINATION WITH AND CONCURRENCE BY YOUR OFFICE. OUR CONTRACTOR, ISOTOPES INC, WILL SUBMIT FULL TECHNICAL DETAILS OF THE PROPOSED RELEASE TO YOUR OFFICE FOR APPROVAL. THE OFFICE OF THE TEST MANAGER, R.H. THALGOTT, HAS BEEN ADVISED OF THE CONTENTS OF THIS MESSAGE BY TELEPHONE THIS DATE.

ELI B. ROTH

FIELD OPERATIONS DIVISION

WEAPONS EVALUATION AND CONTROL

BUREAU, U.S. ARMS CONTROL AND DISARMAMENT AGENCY

BT

bcc: Safety Div.
Rad. Safe Br.
Tech.Supp:AMO/RF

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DEC 4 P.M.

USAEC-NVOO
R E MILLER, MANAGER
LAS VEGAS, NEVADA

ELI B ROTH, FIELD OPNS DIV, WEAPONS EVAL & CONTROL
BUREAU, US ARMS CONTROL & DISARMAMENT AGENCY, WASH.D.C.

INFO: USAEC, J S KELLY, DPNE, WASHINGTON, D. C.

USAEC, MAJ GEN E B GILLER, AGNMA, WASHINGTON, D. C.

USAEC, M B BILES, DOS, WASHINGTON, D. C.

THIS OFFICE HAS RECEIVED AND REVIEWED THE TEST PLAN FOR FIELD TEST FT-60 (PHASE I, RULISON) PROVIDED BY YOUR LETTER OF NOVEMBER 20, 1969.

ON PAGE 8 OF THE SUBJECT PLAN, ITEM IV.B.4. CALLS FOR EMPLACING A SOURCE OF XENON-133 OR KRYPTON-85 NEAR SURFACE GROUND ZERO WITH SUBSEQUENT RESAMPLING AT ALL SAMPLING LOCATIONS. THIS PORTION OF THE PLAN IS A MATTER OF SOME CONCERN TO THIS OFFICE. AS YOU ARE PROBABLY AWARE, THE U. S. ATOMIC ENERGY COMMISSION AND THE INDUSTRIAL PARTICIPANTS IN PROJECT RULISON ARE CURRENTLY INVOLVED IN LITIGATION OVER THE RULISON DETONATION AND THE PROPOSED SUBSEQUENT POST-SHOT PROGRAM. PRIOR TO THE DETONATION, THE U. S. DISTRICT COURT JUDGE HEARING THE CASE PLACED ON THE GOVERNMENT THE RESTRICTION THAT THERE WOULD BE NO REENTRY INTO THE CHIMNEY UNTIL AT LEAST SIX MONTHS POST-DETONATION UNLESS PRIOR APPROVAL WAS RECEIVED FROM THE COURT TO ENTER THE CHIMNEY EARLIER. DURING THE SIX-MONTH PERIOD, THE COURT WILL HEAR THE CASE AS TO WHETHER OR NOT

Manager
Miller

Safety Div	Dep. TM	Test Mgr.	Dir,Pub.Aff.	Ch. Counsel	Dep. M
Hendricks:cds	Allaire	Thalgott	Vermillion	Fleming	Willi
12/4/69					

DEC 4 P.M.

A PERMANENT INJUNCTION AGAINST REENTRY AND FLARING SHOULD BE ENTERED AGAINST THE GOVERNMENT.

WHILE RECOGNIZING THAT YOUR AGENCY IS NOT DIRECTLY AFFECTED BY THIS RESTRICTION, I DO NOT BELIEVE IT APPROPRIATE FOR ONE AGENCY OF THE GOVERNMENT TO RELEASE RADIOACTIVE GAS AT THE SAME LOCATION WHERE A SECOND AGENCY HAS BEEN TEMPORARILY RESTRICTED FROM SUCH ACTIONS BY A FEDERAL COURT. ALSO, WE ARE UNSURE WHAT EFFECT SUCH A RELEASE MIGHT HAVE ON THE OUTCOME OF THE PENDING LITIGATION. I THEREFORE REQUEST THAT THIS PORTION OF YOUR PROGRAM BE HELD IN ABEYANCE UNTIL AT LEAST AFTER CONCLUSION OF THE COURT CASE CURRENTLY SCHEDULED TO BEGIN THE WEEK OF JANUARY 12, 1970. FOR YOUR INFORMATION, DISCOVERY DEPOSITIONS OF SEVERAL OF THE GOVERNMENT'S WITNESSES WILL BE TAKEN THE WEEK OF DECEMBER 8-12, 1969.

IN VIEW OF THE COMMISSION'S RESPONSIBILITY FOR DETERMINATION OF THE RADIATION EXPOSURE TO THE RESIDENTS OF THE RULISON AREA, I ALSO REQUEST THAT ADDITIONAL INFORMATION BE PROVIDED US REGARDING THE TOTAL NUMBER OF CURIES OF RADIOACTIVE GAS PROPOSED TO BE RELEASED TOGETHER WITH ANY PREDICTIONS OF EXPOSURE OR DOSE COMMITMENT AS A FUNCTION OF DOWNWIND DISTANCE.

SHOULD YOU WISH ANY FURTHER INFORMATION OR HAVE ANY QUESTIONS, PLEASE CONTACT MR. ROBERT E. THALGOTT, TEST MANAGER, NEVADA OPERATIONS OFFICE.

cc: A. D. Thornbrough, Dir., OPNE, NV
T. O. Fleming, Chief Counsel, NV
E. G. Vermillion, Dir., Pub. Aff., NV

OR:DW H-113